

OpenIOOS Interoperability Test-bed and Demonstration Products for the Integrated Ocean Observing System (IOOS)

Background

Led by the National Office for Integrated and Sustained Ocean Observations (Ocean.US), the nation is engaged in an effort to integrate and enhance coastal and ocean observations to benefit scientific and societal purposes (www.ocean.us/ioosplan.jsp). A key element of implementing an integrated ocean observing system (IOOS) is a framework of compatible data management techniques that allow the discovery, access, transport, quality control, and integration of disparate data. This effort is being addressed at multiple levels under the guidance of the Data Management and Communications (DMAC) plan formed by Ocean.US (<http://dmac.ocean.us/index.jsp>). The OpenIOOS Interoperability Test-bed is an institution-neutral partnership that enables the evaluation and testing of IOOS data aggregation and integration techniques within a controlled, distributed test-bed environment.

Since 2002, funding has been directed to various institutions to develop an observing system capacity at the regional and subregional levels. Largely funded through the National Oceanic and Atmospheric Administration (NOAA) (www.csc.noaa.gov/cots/) and the Office of Naval Research (ONR), these pilot regional observing systems have established data collection and management capabilities and serve as a foundation for development of regional coastal ocean observing systems (RCOOS). In the winter of 2003–2004, these programs participated in an effort to demonstrate community cooperation in development of a national data product. Based on community-accepted World Wide Web Consortium (W3C) (www.w3.org) and Open GIS Consortium (OGC) standards, the demonstration product aggregated and displayed sea surface temperature and wind data from over 15 different data providers (www.openioos.org). This demonstration product was subsequently used during the summer 2004 to provide real-time and retrospective visualizations of the passage of Hurricanes Frances, Ivan, and Jeanne (Figure 1) and incorporated additional parameters such as water level, wave predictions, weather radar, landfall analyses, chlorophyll, and hurricane tracks from data providers in the Southeast.

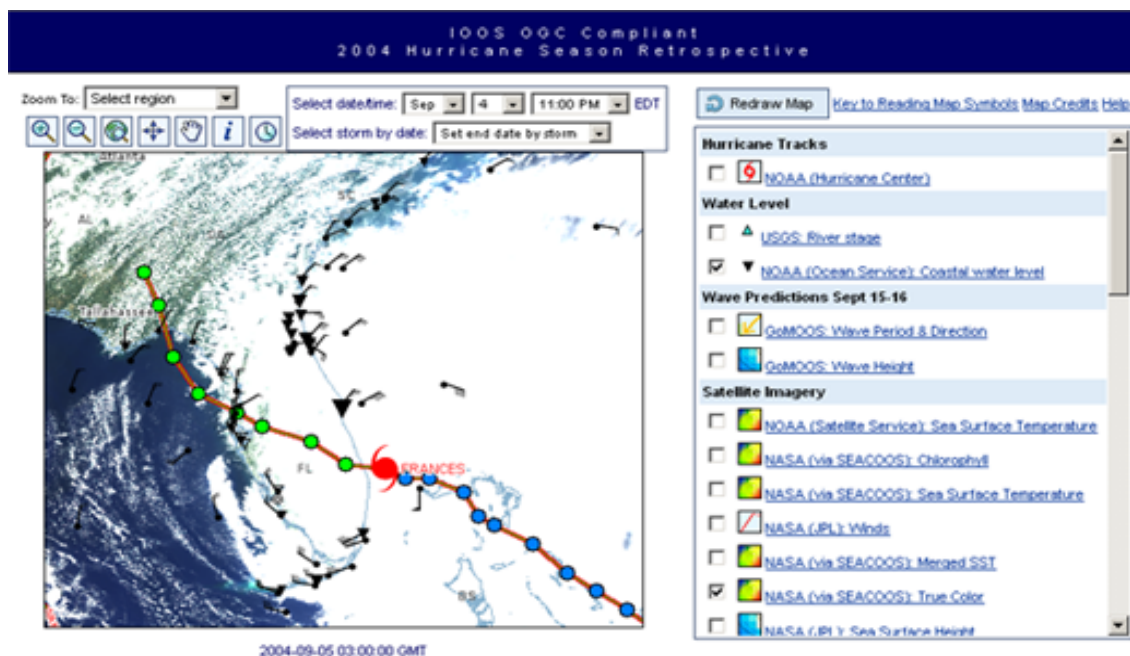


Figure 1. Hurricane Frances retrospective product (www.openioos.org).

At a workshop held November 2004, participants representing regional pilot projects and IOOS Regional Associations agreed to continue product development that demonstrates community cooperation, advances the goal of data interoperability, and provides demonstration products to showcase the value of an IOOS. The goal agreed upon is a technical demonstration of interoperability providing regionally relevant and timely information that will develop ongoing community interaction. The demonstration, the OpenIOOS Interoperability Test-bed, is a proof-of-concept activity that also embraces the long-term vision of interoperability across IOOS, enabled by community-based cooperative development. Volunteer “work groups,” aligned along key interoperability enabling issues, were assembled to initiate planning for contributions to the demonstration product (www.csc.noaa.gov/cots/workshop.htm).

Three components of Interoperability Testbed activities

Three interrelated components (product lines) of the demonstration are being developed concurrently, all of which are thought of as incremental steps to achieving and demonstrating interoperability. These are 1) standards development, 2) national-scale community test-bed, and 3) regional products.

Standards development

Standards and protocols for metadata, data quality, and data transport and integration—the building blocks of IOOS interoperability—are fundamental to making progress on IOOS interoperability. In collaboration with DMAC, regional groups, and targeted efforts such as the QARTOD (Quality Assurance of Real-time Ocean Data), this component will target high-priority variables of interest to the IOOS community to develop and test metadata, quality assurance and quality control (QA/QC), data transport, and assembly protocols. These can then be incorporated into national and regional products as they become available. A demonstration steering committee will provide a “how to” list to help other organizations who want to learn how to participate, including explanations of how project activities fit into the DMAC plan.

National-scale community test-bed

The second component is a national-level technical demonstration of interoperability among a wide range of data sources. This activity will engage a broad number of data providers to address metadata and data transport issues, and can be used to evaluate different methodologies and approaches (test-bed) to determine future directions. The national-level component of the demonstration will expand on the initial interoperability demonstration (www.openioos.org) by incorporating chlorophyll, waves, and surface current data. To the extent practicable, access to data will be accomplished by using Web services.

Regional product development

The third component of the demonstration is the development of regional nowcast and forecast products that focus on issues of importance within the respective regions. An example of a regional nowcast piece is the hurricane product. Each regional nowcast will be based on regionally relevant events as determined by the regions. The regional event pieces enable a more detailed focus and data and information resolution than the national-level demonstration. Within regions, various efforts are underway to achieve data integration to support particular issues. This activity will develop a number of regional and local applications that utilize, as needed, the core variables above (along with other variables as appropriate) to demonstrate the utility of ocean observing data in addressing a range of regional issues (such as coastal erosion, harmful algal blooms, rip currents, etc). As the interoperability standards are adopted, the demonstrations will increasingly provide integrated data and model output in real or near-real time.

Southeast hurricane visualization product

An initial product to be developed from this effort is the Southeast hurricane visualization product. This hurricane product builds from previous efforts and will be ready for the summer of 2005. The test-bed activities will leverage its availability for three primary purposes: to serve as a highly relevant proof of concept for development of other regional applications, to provide a technical framework for constructing future regional theme products, and to prototype continually evolving standards for interoperability, QA/QC, and other elements.

The hurricane product demonstrates interoperability by employing established W3C and OGC standards. Its practical theme (i.e., coastal response to hurricanes) has special relevance to the southeastern U.S. Incorporating several parameters (such as water level, waves, winds, sea surface temperature, and hurricane tracks, among others) and aggregating data from more than a dozen different providers, when completed the 2005 demonstration will show real-time information about the passage of hurricanes and their associated environmental effects during the 2005 hurricane season. The addition of further regional event demonstrations will be an incremental activity as the individual regions design, develop, and make available the necessary data relevant for each event-based nowcast.

A number of regional and national programs have related technology development and evaluation efforts underway, and OpenIOOS provides a common ground for exploring the power of integration that can be achieved when distributed and disparate programs conform to a recommended set of standards and Web service specifications. The OpenIOOS Interoperability Test-bed is coordinated with DMAC efforts and serves as a distributed forum for developing, sharing, and testing key components of IOOS interoperability. This activity, including the partners and products, is continually evolving. To learn more, visit www.openioos.org.

For more information

Please visit www.openioos.org or email help@openioos.org